INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

3 October 2017 (am)

Subject ST9 – Enterprise Risk Management

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

3. *You have 15 minutes of planning and reading time before the start of this examination. You may make separate notes or write on the exam paper but not in your answer booklet. Calculators are not to be used during the reading time. You will then have three hours to complete the paper.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all three questions, beginning your answer to each question on a new page.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 A businessman is setting up a new insurance company, SportSafe, which is intended to provide insurance for the sporting equipment used by professional sportspeople in a particular country.

Initially, only professional cyclists based in that country will be targeted. Equipment will be covered for damage in the course of a sporting event, and for theft. The sporting events covered include any held overseas.

The businessman intends to recruit a Chief Actuary who will also act as Chief Risk Officer (CRO). All employees of the company will work in the same open-plan office.

(i) Propose a structure for the company's central risk function. [3]

Five years later, SportSafe has become a successful provider of sporting equipment insurance. It still restricts its cover to professional sportspeople, and to damage of sporting equipment in the course of an event and theft.

However, it has expanded its strategy and now also covers a range of other sports such as golf, tennis, hockey and badminton. The cover is still for domestic sportspeople only.

(ii) Comment on how enterprise risk management (ERM) considerations may have influenced this change in strategy. [3]

To deal with the additional business, the company now employs 100 people, spread across three offices: a head office, an office housing the sales function, and an administration centre. The company's Chief Actuary, who is based in the head office, is still also acting as CRO. Three actuarial trainees work alongside him, as the central risk function. They take the data for their reports to the Chief Actuary from the monthly management information reports provided by each department of the business. They are also responsible for designing and distributing the risk management procedures to each of the departments. These procedures set out how each department must operate. Any work outside of these procedures must be authorised by the central risk function.

(iii) Comment on the issues that could arise from the current approach to ERM. [4]

(iv) Suggest ways in which the approach could be improved. [3]

Another two years later, SportSafe continues to be successful. It is considering changing its strategy again, by expanding to provide insurance to professional sportspeople who are based overseas. This would require SportSafe to open offices in these other countries.

(v) Outline the additional risks that SportSafe could face if it expanded in this way. [5]

[Total 18]

2 Privet Partners, an investment company, is planning to launch a new open-ended investment fund. In other words, when someone invests in the fund, new units are created and new money is made available for investments. The fund will invest in rare books and old vinyl music records ('records').

The returns on these two asset types appear to diversify each other reasonably well – the Kendall's tau between the returns on books and records is 0.6.

However, it does appear that when returns are poor, they are more likely to be poor for both asset classes; strong positive returns for either books or records are less likely to coincide.

The books and records used for investment will be sourced by a team of ten specialists, who will attend auctions around the world to buy desirable books and records at good prices. The specialists will also target private book and record collections.

Privet Partners has analysed historical returns in both sectors and, assuming a multivariate normal distribution, has identified the optimal allocation not only to books and records, but to specific sectors within each of these two asset types.

The same analysis predicts annual returns of 10% per annum, with an annualised volatility of 5% per annum, for the optimised overall investment fund.

The median sale time for a book is four weeks and the median sale time for a record is six weeks. However, more expensive books and records tend to take longer to sell.

(i) Describe the main risks to which Privet Partners is exposed in relation to this fund, based on the information above. [5]

(ii) Describe the coefficient of lower tail dependence and its relevance to risk modelling. [4]

(iii) Recommend, with justification, an appropriate copula that could be used to model joint returns between the book and record asset classes. [2]

(iv) Discuss how your answer to part (iii) would change if you were modelling losses rather than returns, with losses being defined as having the opposite sign to returns. [2]

Privet Partners also runs a market-neutral equity fund, which is also an open-ended fund. Its strategy in this fund is to invest in a small number of equities and then to take a short position in an equity index future. It aims to have zero net market exposure.

An analyst has pointed out that the index future covers only large-capitalisation stocks, whilst the stocks that Privet Partners holds in the fund are both large- and small-capitalisation. She notes that using an index future therefore limits the extent to which short positions can be taken. The analyst has suggested instead using equity futures on specific equities to provide the short positions.

(v) Compare the key features of forwards and futures. [4]

(vi) Discuss the analyst's comments and suggestion. [5]

(vii) Describe how the upside on individual equity positions could be sold to buy downside protection on the same equities. [2]

(viii) Explain how a similar approach could be used on the equity index exposure in the market-neutral equity fund. [2]

[Total 26]

3 Yellow Town Society is a small mutual (i.e. not shareholder-owned) society providing a range of bank accounts, savings accounts and mortgages. It currently invests in government bonds and corporate bonds and holds a small amount of cash.

(i) Describe the main financial risks to which Yellow Town Society is exposed. [5]

(ii) Outline the likely components of Yellow Town Society's risk policies that will influence its decisions on corporate bond investment. [7]

Some of the corporate bond investments held by the Society are issued by insurance companies. The Chief Financial Officer (CFO) has suggested that the investment managers should look at Standard & Poor's enterprise risk management evaluation reports and classifications for those companies.

(iii) Discuss this suggestion. [4]

A similar society in another town has recently experienced liquidity issues. The board of Yellow Town Society has asked the risk management function for a report on the Society's own liquidity risk.

(iv) Discuss the approaches that Yellow Town Society could use to measure its liquidity risk exposure. [8]

The CFO of Yellow Town Society has stated:

"The best way to manage liquidity risk is to hold cash. I recommend increasing our cash holding from 5% of the total asset value to 40% of the total asset value."

(v) Comment on the CFO's recommendation. [3]

(vi) Suggest alternative methods by which the Society could manage its liquidity risk. [4]

The board of Yellow Town Society is considering launching an insurance subsidiary in response to this proposal.

The finance function has provided the following information on this option:

- projected balance sheet with and without the new insurance subsidiary
- costs of launching and running the subsidiary
- projected surplus arising with and without the new insurance subsidiary
- cost of raising debt to launch the new insurance subsidiary

The board has requested the following pieces of information from the risk management function:

- current risk appetite
- current risk profile
- projected risk profile
- economic capital requirement for the insurance subsidiary

(vii) Explain why the board has requested this information from the risk management function. [6]

The economic capital requirement calculations include the modelling of a number of management actions.

(viii) Explain what is meant by management actions in this context. [2]

(ix) Suggest the management actions that could be modelled by Yellow Town Society. [4]

The board has decided to use Risk-Adjusted Return on Capital ("RAROC") as a metric to help it to decide whether to launch an insurance subsidiary.

(x) Assess the suitability of RAROC for this purpose. [5]

(xi) Propose two other risk optimisation metrics, relating to economic capital, that the board could use to enable it to assess this option. [2]

(xii) Contrast the key features of the metrics proposed in part (xi) with those for RAROC. [6]

[Total 56]

END OF PAPER